



Assessing and reducing the risk of ground-water contamination from

Milking Center Wash Water Treatment

Keeping Idaho's Water Clean

Fact/Worksheet 10

Why should I be concerned?

Dairy wash water is usually considered a dairy sanitation problem. If not carefully managed, however, dairy wash water can contaminate both surface and ground-water sources.

The amount of wash water generated varies with milking preparation, equipment used, and the number of cows. A 100-cow, free-stall operation may use anywhere from 100 to 1,000 gallons of water per day in the milking center alone.

Milking center wash water is contaminated with organic matter, nutrients, chemicals, and microorganisms. Poorly designed or mismanaged waste water disposal systems can contaminate surface and ground water with ammonia, nitrate, phosphorus, detergents, and disease-causing organisms. Surface water can also be contaminated by manure, milk solids, ammonia, phosphorus, and detergents.

The goal of Home*A*Syst is to help you protect the environment and your drinking water.

How will these materials help me to protect my drinking water?

- It will take you step-by-step through your milking center wash water treatment system.
- It will rank your activities according to how they might affect the ground water that provides your drinking water supply.
- It will provide you with easy-to-understand risk rankings that will help you analyze your milking center wash water treatment practices.
- It will help you determine which of your practices are reasonably safe and effective, and which practices might require modification to better protect your drinking water.

How do I complete the worksheet?

After reviewing the information provided, follow the directions at the top of the chart on page 8. It should take you about 15 to 30 minutes to complete the worksheet and summarize your risk rankings.

Glossary

Milking Center Wash Water Treatment

These terms may help you make more accurate assessments when completing Fact/Worksheet 10. They may also help clarify some of the terms used.

Land application: Application of wash water to croplands and pastures by irrigation equipment or a liquid manure spreader.

Slow surface infiltration: Application of wash water at one end of a gently sloping grass filter strip or terrace so that it is treated as it slowly flows through the plant-soil system. A portion of the flow percolates to ground water, and some is used by vegetation.

Soil permeability: The quality that enables the soil to transmit water or air. Slowly permeable soils have fine-textured materials, like clays, that permit only slow water movement. Moderately or highly permeable soils have coarse-textured materials, like sands, that permit rapid water movement.



Improving Milking Center Wash Water Treatment

Keeping Idaho's Water Clean

Wash water from the dairy milking center includes wastes from the milking parlor (manure, feed solids, hoof dirt) and milk house (bulk tank rinse water and detergents used in cleaning).

From an environmental perspective, delivery of milking center wash water to a liquid manure storage facility, if available, makes the most sense. Dewatering options include overland flow and slow surface infiltration. Solids separators also reduce liquids. Overland flow is the more effective option.

Your drinking water is least likely to be contaminated if you follow appropriate Best Management Practices (BMP's). If you choose to dispose of excess wash water **off the farm**, use proper off-site disposal practices to avoid contamination that could affect the water supplies and health of your family and others.

1. No discharge by combining wastes

Combining milking center wash water with manure has the advantage of allowing a common disposal system for both types of waste. A liquid manure storage facility, properly constructed and sized, provides the additional flexibility of storing wastes until they can be applied at the right time to the right sites at suggested agronomic rates (*Figure 1*).

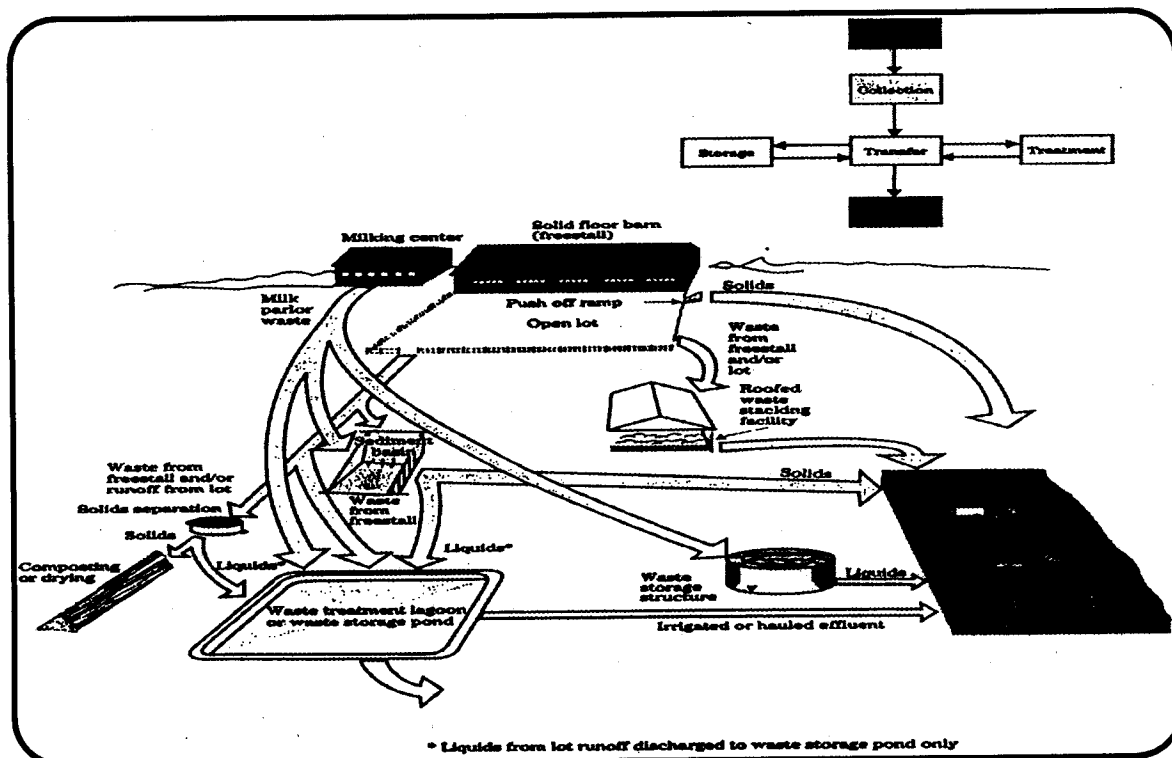


Figure 1: Wash water and manure handling options for dairy farms. Source: Agricultural Waste Management Field Handbook, USDA-Soil Conservation Service, 1992.

Applying milking center waste water with manure to fields at rates that do not exceed crop needs for nitrogen reduces the risk of ground-water contamination from either wastes. Care must be taken, however, to keep soil phosphorus levels from accumulating to levels that will harm crops. On steep land, application rates must be closely monitored to prevent wash water and manure, along with eroding soil, from contaminating nearby streams and lakes.

Milking center wash water combined with runoff from solid manure storage or animal lots can be stored in a detention pond. The contents of the pond can be applied to fields when conditions are appropriate. Site conditions that need to be considered before land application include weather, soil moisture, nutrient requirements of present and future crops, and the farm management plan.

2. Treatment before discharge

While soil and plant systems have a large capacity to absorb and use wastes, treating wash water to remove some wastes before it gets into the soil can extend the effective life of a soil application area. Such pretreatment usually consists of a basin that holds the wash water long enough for heavier particles to settle and lighter solids to float.

A settling lagoon also provides a place for bacteria to decompose some wastes before disposal (Figure 2). This process causes a scum to form on top of the liquid in the basin lagoon.

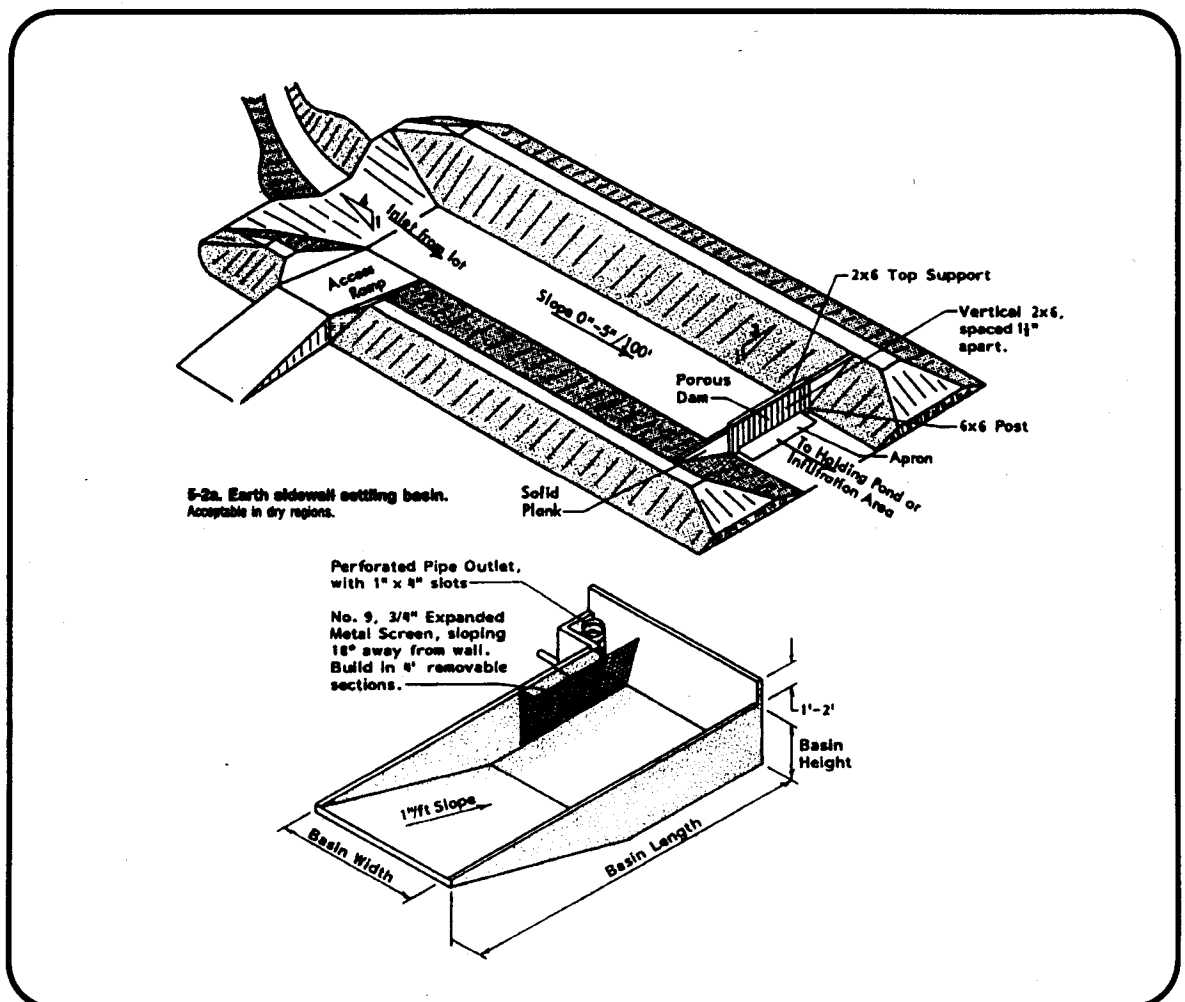


Figure 2: Settling basins.Source: *Livestock Waste Facilities Handbook, Midwest Plan Service, 1985.*

If a mechanical separator is used initially to remove the larger particles, a smaller settling basin may suffice. Removing waste products before washing into a settling basin requires extra effort, but it reduces the rate of solids accumulation, which can extend the period between basin cleanouts. Manure and excess feed, for example, can be treated like, and thus combined with, other animal wastes.

Passing wash water through a shallow treatment pond (also called an aerobic lagoon) results in a more thorough pretreatment. Algae growing in the pond generate oxygen, which can help decompose organic compounds without creating obnoxious odors. Mechanical aerators also may enhance aerobic action, but may cause noxious odors.

Solids that settle to the bottom of the pond usually decompose in the absence of oxygen. To prevent ground-water contamination, such ponds must be built of an impervious material such as packed clay or concrete, or synthetic liner. In some cases, wash water can be discharged to a lagoon without first going through a settling tank. After settling, the waste is best applied at low rates to croplands. Be aware that decomposition processes in this arrangement may generate odors.

Solids from settling basins are an excellent source of organic matter. Gardeners without access to manure can use the solids to improve top soil.

3. Land application methods

Treating wash water for direct discharge to a stream or lake is too expensive for most dairy farms. The soil provides the most cost-effective treatment and use of wastewater. Direct, daily discharge is not recommended because it will result in application to frozen, saturated, or snow-covered soil. Several methods are available, however, for dewatering and using wash water from retention and treatment structures. Two options are approved for use in Idaho:

- Direct cropland application
- Use in composting operations

Applying wash water to cropland at low application rates poses the least potential for surface or ground-water contamination. The soil can assimilate the dispersed manure and crops can use some of the nutrients, thus preventing nutrients from entering surface or ground water.

Any methods that involve application of wash water or manure to the soil surface should be preceded by a soil analysis and a plan for use of these nutrients by crops. These applied nutrients should be credited in your fertilizer program.

Field application

Dairy wash water can be applied to croplands and pastures with portable irrigation equipment or a liquid manure spreader. Field application timing and rates should be based on site-specific factors, such as soils, the crops to be grown, topography, flood hazard, and proximity to water bodies.

Milking center wash water applied to cropland at agronomic rates reduces the danger to ground water because the soil filters or plants take up potential contaminants. Wash water and manure should be incorporated into the soil whenever possible. Avoid land application of wastes within 200 feet of water courses or water bodies, or in flood plains during flooding seasons unless incorporated. Do not saturate soils, as this can allow rapid percolation to ground water or runoff to surface water. To maximize the efficiency of this system, harvest the crop or other vegetation. Windbreak or woodlot application may also be suitable, in which case harvest is not needed.

Slow surface infiltration

Wash water can be applied at one end of a gently sloping grass filter strip or terrace. By spreading **pretreated** wash water over a vegetated soil surface, organic compounds and bacteria can be treated or filtered out as wastes flow in sheet form over the sloped, vegetated soil surface and percolate through the soil (*Figures 3 and 4*). Precipitation could overwhelm this system. This system works best on well-drained, loamy soils with at least four feet to bedrock or ground water. The area should be designed to minimize runoff during heavy rain or snowmelt.

A controlled system of distribution and flow is required. Managing wash water safely requires that the waste storage lagoon and land application area be large enough to handle wastes during periods when land application is unacceptable. Harvesting the infiltration area is needed to keep vegetation from decomposing and releasing nutrients that have the potential for ground-water contamination.

Properly operated, a slow infiltration system poses a moderate risk of ground-water contamination from nitrate and other soluble compounds. There is a low risk of contamination from organic matter, pathogenic (disease-causing) microorganisms, phosphorus, or detergents.

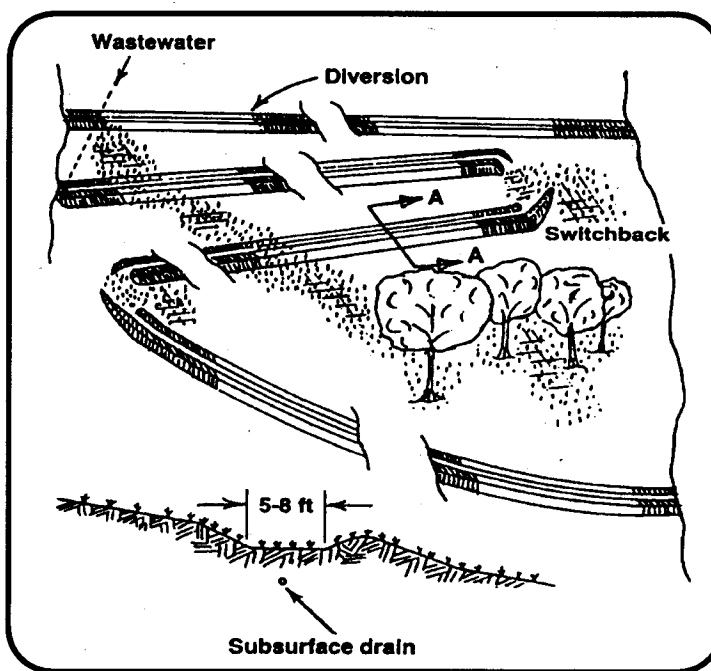


Figure 3: 1 to 2% infiltration terrace. Source: *Milking Center Wastewater Disposal, Manure Management for Environmental Protection, Document DM7, Pennsylvania Department of Environmental Resources, October 1986.*

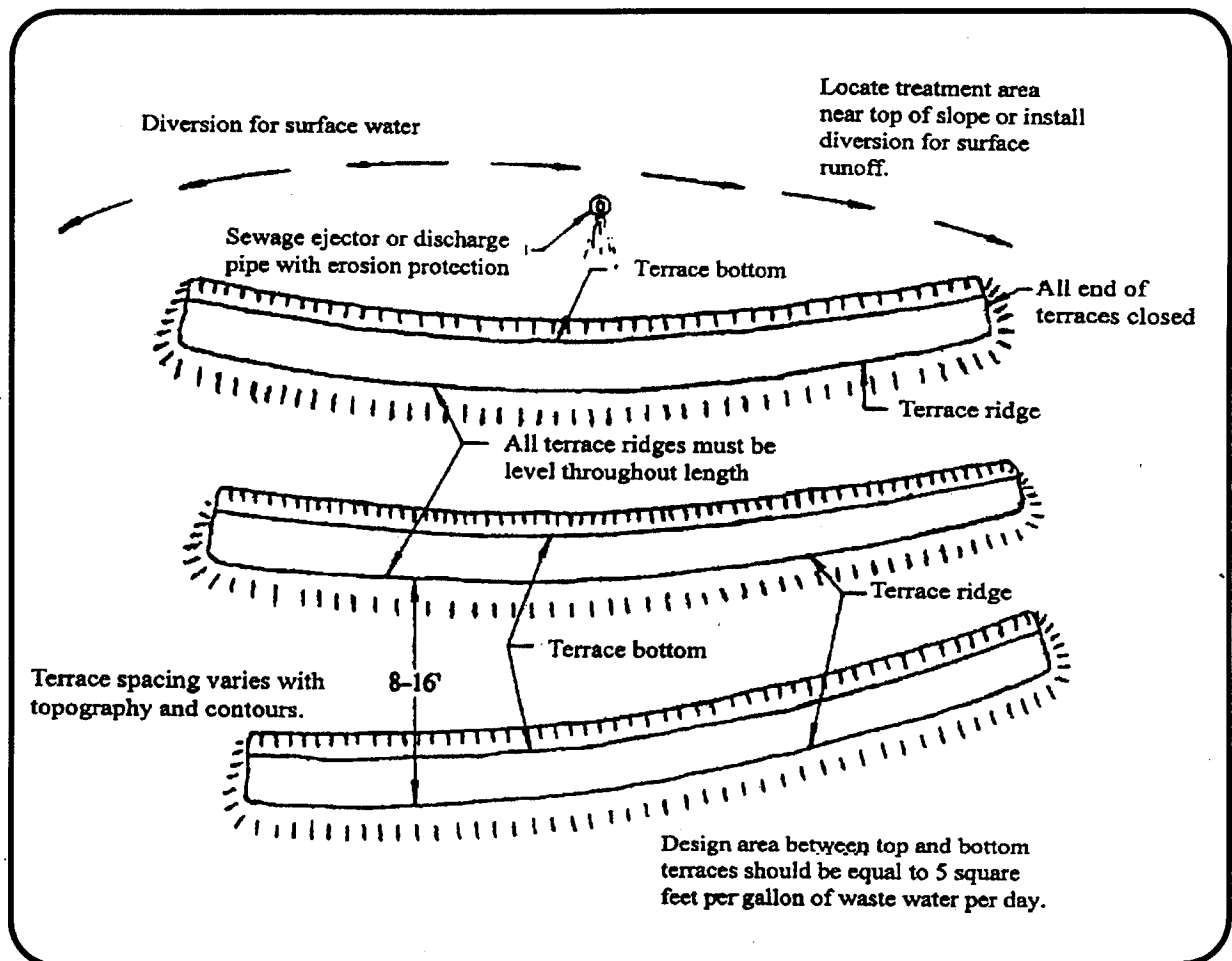


Figure 4: Contour terraces. Source: *Treatment and disposal of Milkhouse and Milking Parlor Wastes*, D.W. Bates and R.E. Machmeier, University of Minnesota Agricultural Extension Service, M-159, 1977.

Worksheet 10

Milking Center Wash Water Treatment: Assessing Drinking Water Contamination Risk

1. Use a pencil. You may want to make changes.
2. For each category listed on the left that is appropriate to your homestead, read across to the right and **circle** the statement that **best** describes conditions on your homestead (skip and leave blank any categories that don't apply to your homestead).
3. Then look above the description you circled to find your "rank number" (4, 3, 2, or 1) and enter that number in the blank under "your rank."
4. Complete the section "What do I do with these rankings?"
5. Allow about 15 to 30 minutes to complete the worksheet and summarize your risk rankings for milking center wash water treatment practices.

	LOW RISK (rank 4)	LOW-MOD RISK (rank 3)	MOD-HIGH RISK (rank 2)	HIGH RISK (rank 1)	YOUR RANK
NO DISCHARGE METHODS (Addressed in Section 1)					
All wash water to storage and later applied to fields*	Wash water delivered directly to liquid manure storage. No discharge expected.	_____	_____	Wash water delivered to leaking or frequently overflowing manure storage.	_____

**If using this practice, do not complete the rest of this worksheet.*

TREATMENT OF MILKING CENTER WASH WATER BEFORE DISPOSAL (Addressed in Section 2)

Milking practices	First pipeline rinse captured and added to barn manure. Waste milk never poured down drain. Manure and excess feed removed from parlor before wash-down.	Waste milk poured down drain 10 percent of the time. Manure and excess feed usually removed before wash-down.	Waste milk poured down drain 50 percent of the time. Manure and excess feed often washed down drain.	All waste milk poured down drain emptying into ditch. Manure and excess feed frequently washed down drain emptying into ditch.	_____
Storage/settling tank liner	Concrete or plastic lined.	Clay lined.	Cracked or porous liner.	No liner to prevent seepage.	_____
Settling tank cleanout	Tank cleaned as needed or every month.	Tank cleaned every 3-4 months.	Annual cleaning.	Tank never cleaned.	_____
Liquid storage period following settling	9-12 months.	1 week to 9 months.	Less than 1 week.	No storage/settling. Wash water discharged directly to soil as generated.	_____

	LOW RISK (rank 4)	LOW-MOD RISK (rank 3)	MOD-HIGH RISK (rank 2)	HIGH RISK (rank 1)	YOUR RANK
LAND APPLICATION SITE					
Distance from drinking water well	More than 250 feet downslope from well.	More than 250 feet upslope from well.	Less than 250 feet downslope from well.	Less than 250 feet upslope from well.	_____
DISCHARGE METHODS (Addressed in Section 3)					
Field application	Applied to growing crops. Nutrient and water needs of crop not exceeded. Vegetation removed regularly.	Applied to uncropped fields. Nutrient and water needs of vegetation not exceeded. Vegetation removed occasionally.	Applied to cropped or uncropped fields. Plant nutrient needs not exceeded. Plant water needs exceeded occasionally. Vegetation may or may not be removed.	Applied consistently to same area. Rates exceed vegetation nutrient and water needs. Vegetation rarely removed.	_____
or					
Slow surface infiltration	Combined with high-level pretreatment. Medium or fine-textured soil (silt loam, loam, clayloams, clay) more than 10 feet to water table or bedrock. Extended rest period between loadings. Vegetation removed.	Combined with high-level pretreatment. Medium or fine-textured soil (silt loam, loam, clayloams, clay) more than three feet to water table or bedrock. Extended rest period between loadings. Vegetation removed.	Some pretreatment. Medium or fine-textured soil (silt loam, loam, clay to three feet over bedrock or high water table. Vegetation not removed.	No pretreatment. Less than two feet of medium or fine-textured soil (silt loam, loam, clay loams, clay) above bedrock or high water table. Vegetation not removed.	_____

What do I do with these rankings?

Step 1: In the table below, summarize your risk scores by checking the appropriate box for each category you completed on this worksheet.

Milking Center Wash Water Treatment Risk Rankings Summary

CATEGORY	Risk Rank			
	Low 4	3	2	High 1
All wash water to manure storage and later applied to fields				
Milking clean-up practices				
Storage/settling tank liner				
Settling tank clean-out				
Liquid storage period				
Distance from drinking water well				
Field application				
Slow surface infiltration				

Step 2: Look over your rankings for individual activities.

High Risk Practices (1) Pose a high risk for your health and for contaminating ground water.

Moderate to High Risk Practices (2) Are inadequate protection in many circumstances.

Low to Moderate Risk Practices (3) Provide reasonable ground-water protection.

Low Risk Practices (4) Are ideal; try to make this your goal.

Any shaded rankings require immediate attention. Some concerns you can take care of right away; others could be major or costly projects, requiring planning and prioritizing before you take action. The long term goal of the Home*A*Syst program is to improve homestead practices and structures so that they are classified as low risk. Activities classified as low risk generally reflect best management practices.

Transfer any activities that you ranked in the shaded areas in step 1 to the "High-Risk Activities" on pages two, three, and four of Worksheet B.

Step 3: Read the materials provided in this document if you haven't already. Consider how you might modify your homestead practices to better protect your drinking water.

Contacts and References

Who to call about...

Potential ground-water contamination from your milking center wash water

Your local public health district, Soil Conservation District (SCD), or Natural Resources Conservation Service (NRCS) office.

Sources of financial assistance

Your county Farm Service Agency (FSA).

Review of construction plans

To be sure that sanitation and water quality regulations are being met, contact University of Idaho Cooperation Extension System (CES) and/or your local NRCS office.

Securing a permit

Before committing to a new facility, contact the Division of Environmental Quality regional office for your area:

North (Coeur d'Alene):	(208)769-1422
North Central (Lewiston):	(208) 799-4370
Southwest (Boise):	(208) 373-0550
South Central (Twin Falls):	(208) 736-2190
Southeast (Pocatello):	(208) 236-6160
Eastern (Idaho Falls):	(208) 528-2650

Contact your County Planning and Zoning Commission for any local regulations pertaining to securing new permits.

Designing wash water treatment systems

Your county SCD, NRCS, or local CES office.

What to read about...

Your county SCD, NRCS, or local CES office.

Publications are available from sources listed at the end of the reference section. Refer to number in parentheses after each publication.

Ground-water contamination, protection, and testing

- *CAFO Waste Management Guidelines (DEQ)*
- *Managing Livestock Manure to Protect Groundwater EB1717 (1)*
- *Keys to Dairy Manure Management for Water Quality EB1658 (1)*
- *Livestock Manure Lagoons Protect Water Quality EB1642 (1)*
- *Liquid Manure Injection EB1004 (1)*
- *How Fertilizers and Plant Nutrients Affect Groundwater Quality EB1722 (1)*
- *Water Quality for Domestic Use: Resource Handbook (1)*

Design criteria and general information

- *Agricultural Waste Management Field Handbook*. 1992. (3). A recent, comprehensive guide addressing animal management and resource protection.
- *Dairy Housing and Equipment Handbook*. Midwest Plan Service. MWPS-7.(2). Presents dairy facility and equipment planning and design. Discusses milking herd facilities, milking centers, manure management, housing needs, and basic farmstead planning principles.
- *Livestock Waste Facilities Handbook*. Midwest Plan Service. MWPS-18. (2). Emphasizes planning and design of livestock waste facilities and equipment. Reports agricultural waste data for manure, bedding, feedlot runoff, and milking center wash water.

Land application of animal waste

- *How to Calculate Manure Application Rates in the Pacific Northwest* PNW0239 (1)
- *Livestock Waste Facilities Handbook*. 1985. Midwest Plan Service. (2). Includes information about animal waste characteristics, collection and transport to storage, open lot waste handling, land application techniques, and waste use. Worksheet helps producers determine manure application rates for their system.
- *Guidelines for Land Disposal of Feedlot Lagoon Water*. C-485. (1)

Publications available from...

- Your county Cooperative Extension System office. There may be charges for publications, postage, and sales tax.
- Your county Cooperative Extension System office or the Midwest Plan Service, Iowa State University, Ames, Iowa, 50011, (515) 294-4337.
- Your local Natural Resources Conservation Service (NRCS) office.

NOTES



The Homestead Assessment System is a cooperative project developed, coordinated, and supported by the following agencies and organizations:

Idaho Association of Soil Conservation Districts (IASCD)
Idaho Department of Agriculture (IDA)
Idaho Department of Health and Welfare-Division of
Environmental Quality (IDHW-DEQ)
Idaho Department of Water Resource (IDWR)
Idaho Public Health Districts
Idaho Soil Conservation Commission (SCC)
Idaho Water Resources Research Institute (IWRRI)
University of Idaho-Cooperative Extension System (CES)
USDA-Farm Service Agency (FSA)
USDA-Natural Resources Conservation Service (NRCS)
USDA-Rural Economic and Community Development
(RECD)
U.S. Environmental Protection Agency (EPA)

Adapted for Idaho from material developed by the **Washington Home *A* Syst and Wisconsin Farm*A*Syst Programs. Idaho Home*A*Syst development was supported by the National Farmstead Assessment Program.**

Information derived from **Home*A*Syst** worksheets is intended only to provide general information and recommendations to rural residents regarding their own homestead practices. All results are confidential.

Programs and policies are consistent with federal and state laws and regulations prohibiting discrimination on the basis of race, color, religion, national origin, sex, age, disability, political beliefs, and marital or familial status. Trade names have been used to simplify information; no endorsement is intended.
Published 1996.